What is claimed is:

1   1. A video signal including additional information therein, said video signal being

2   characterized in that at least a portion of said additional information has been impressed

3   upon a chrominance portion of said video signal by placing it in at least one selected bit

4   position of a value derived from an average of said chrominance portion over a block of

5   said video signal.

1   2. The invention as defined in claim 1 wherein said portion of said additional

2   information is a bit.

1   3. The invention as defined in claim 1 wherein said additional information

2   replaces at least one bit of said value derived from said average of said chrominance

3   portion over said block.

1   4. The invention as defined in claim 1 wherein said value derived from an

2   average of said chrominance portion over a block of said video signal is the average of

3   the values of said chrominance portion for each pixel of said block.

1   5. The invention as defined in claim 1 wherein said additional information is not

2   substantially perceivable by the human visual system when said video signal including

3   said additional information is displayed on a display device.

1   6. The invention as defined in claim 1 wherein said additional information was

2   impressed by changing the value of said chrominance portion of various pixels of said

3   block, and wherein the magnitude of the change in value any pixel is a function of the

4   amount of change that can be introduced into said pixel without resulting in an artifact

5   that is substantially detectable by the human visual system.

1   7. The invention as defined in claim 1 wherein said additional information was

2   impressed by changing the value of said chrominance portion of various pixels of said

3   block, and wherein the magnitude of the change in value any pixel does not exceed the

4   amount of change that can be introduced into said pixel without resulting in an artifact

5   that is substantially detectable by the human visual system.

1   8. The invention as defined in claim 1 wherein the position of said selected bit is

2   fixed for at least one block of at least one frame of said video signal.

1   9. The invention as defined in claim 1 wherein the position of said selected bit is

2   dynamically determined for at least one block of at least one frame of said video signal.

1   10. The invention as defined in claim 1 wherein the position of said selected bit is

2   determined based on a texture variance of said block.

1   11. The invention as defined in claim 1 wherein said bit position into which said

2   additional information is impressed is a bit of the integer portion of said value derived

3   from said average.

1   12. The invention as defined in claim 1 wherein said block of said video signal is

2   in a reduced resolution format such that for each 2x2 luminance block of an original

3   version of said video signal, had said original version of said video signal been in 4-4-4

4   representation, there remains only one Y, one U, and one V value.

1   13. The invention as defined in claim 1 wherein said average of said chrominance

2   portion over said block of said video signal is a DC coefficient of said block in a

3   frequency domain representation of said block of said video signal.

1   14. The invention as defined in claim 1 wherein said additional information was

2   placed in said at least one selected bit position in a manner that makes a minimum change

3   to said average.

1 15. The invention as defined in claim 1 wherein said additional information was
2 placed in said at least one selected bit position by adding a value to said average so as to
3 make the value of said at least one bit position of said value derived from said average the
4 same as said additional information to be impressed.

1 16. The invention as defined in claim 1 wherein said additional information was
2 placed in said at least one selected bit position by adding a value to said average so as to
3 make said at least one bit position the same in said value derived from said average as
4 said additional information to be impressed while making only a minimum change to the
5 value of said average when impressing said data.

1 17. The invention as defined in claim 1 wherein said additional information was
2 placed in said at least one selected bit position by adding a value to said average so as to
3 make said at least one bit position of said value derived from said average the same in
4 value as said additional information to be impressed, said adding to said average having
5 been achieved by adding an amount to the said chrominance portion of various pixels of
6 said block, said additions to said pixel chrominance portions being made until a total of
7 such additions equals the product of said value and the number of pixels in a block, said
8 additions being independent of any other changes made to the chrominance portion of
9 said pixels.

1 18.   The invention as defined in claim 1 wherein said video signal further
2 comprises a margin signal added thereto to reduce the likelihood that said additional
3 information will be eliminated should said video signal undergo quantization

1 19.   The invention as defined in claim 1 wherein said video signal further
2 comprises a margin signal added thereto to reduce the likelihood that said additional
3 information will be eliminated should said video signal undergo motion picture experts
4 group (MPEG)-type encoding.

1   20. The invention as defined in claim 1 wherein said additional information was
2   placed in said at least one selected bit position by adding only a minimum necessary
3   amount to said average so that in said value derived from said average said at least one bit
4   position is made to have the same value as said additional information to be impressed
5   and said value derived from said average is within a safe range.

1   21. The invention as defined in claim 1 wherein said additional information is
2   interleaved within said video signal with respect to its ordering prior to undergoing a
3   process to be impressed therein.

1   22. The invention as defined in claim 1 wherein said additional information is
2   channel encoded within said video signal. .

1   23. Apparatus for embedding additional watermarking data within a video signal,
2   comprising:
3   a color selection unit for selecting a chrominance portion of a block of said video
4   signal to carry a portion of said additional watermarking data; and
5   a data adder that adds information to pixels of said block of said video signal
6   thereby causing a change in the average value of said selected chrominance portion so as
7   to incorporate at least a portion of said additional watermarking data within said changed
8   average value.

1   24. The invention as defined in claim 23 wherein said color selection unit
2   comprises a prestored table in computer readable form that indicates for each area within
3   at least a colorspace portion which chrominance portion should be selected for pixels
4   within said each area.

1   25. The invention as defined in claim 23 further comprising a block interleaver
2   that interleaves said additional watermarking data prior to said additional watermarking
3   data being incorporated within said changed average value.

1   26. The invention as defined in claim 23 further comprising a channel encoder

2   that channel encodes said additional watermarking data prior to said additional

3   watermarking data being incorporated within said changed average value.

1   27. The invention as defined in claim 23 wherein said data adder modifies only a

2   said selected chrominance portion of said pixels and further comprising a multiplexer for

3   multiplexing at least the unmodified chrominance portion of said pixels and said

4   modified chrominance portion of said pixels.

1   28. The invention as defined in claim 23 wherein said data adder further

2   comprises a bit mapper.

1   29. The invention as defined in claim 23 wherein said data adder further

2   comprises a texture masking unit that determines a amount of change in said chrominance

3   portion that a pixel can endure while minimizing the likelihood of a visible artifact

4   resulting, and wherein said data adder adds no more than said amount to said pixel.

1   30. The invention as defined in claim 23 wherein said data adder adds a further

2   value to pixels of said block of said video signal thereby causing the resulting new

3   average value to be within a safe range.

1   31. The invention as defined in claim 23 wherein said data adder changes said

2   average value by the least amount necessary to carry said additional watermark data.

1   32. The invention as defined in claim 23 wherein said data adder adds a further

2   value to pixels of said block of said video signal thereby causing the resulting new

3   average value to be within a safe range and wherein said data adder further adds to pixels

4   of said block the value that changes said average value by the least amount possible.

1   33. The invention as defined in claim 23 wherein said video signal has the same

2   resolution before and format after being watermarked by said video signal, but wherein

3   said apparatus operates in a reduced resolution format such that for each 2x2 luminance

4   block of an of said video signal before watermarking, had said video signal before

5   watermarking been in 4-4-4 representation, there remains only one Y, one U, and one V

6   value in said reduced resolution format of said video signal.

1   34. Apparatus for embedding additional watermarking data within a video signal,

2   comprising:

3   means for selecting a chrominance portion of a block of said video signal to carry

4   a portion of said additional watermarking data;

5   means for causing a change in the average value of said selected chrominance

6   portion so as to incorporate at least a portion of said additional watermarking data within

7   said changed average value.

1   35. The invention as defined in claim 34 wherein said means for causing a change

2   changes said average value by placing in a selected bit position thereof at least a portion

3   of said additional information.

1   36. The invention as defined in claim 34 wherein said means for causing a change

2   changes said average value by placing in a selected bit position thereof at least a portion

3   of said additional information and further changes said average value so it is within a safe

4   range.

1   37. The invention as defined in claim 34 wherein said means for causing a change

2   effectuates said change in said average value by changing the values of said selected

3   chrominance portion of one or more of the pixels of said block.

1   38.   A method for use in extracting watermark data from a watermarked video
2   signal, wherein said watermark data is carried in at least one bit position of an average of
3   the values of a chrominance portion of the pixels of at least one block of at least one
4   frame, the method comprising the step of:
5   selecting a chrominance portion that is likely to be carrying said watermark data in
6   said average of said values of said chrominance portion for said block;
7   extracting said watermark data from said average of said values of said selected
8   chrominance portion.

1   39.   The invention as defined in claim 38 further comprising the step of
2   determining which bit position of said average of said values is carrying said watermark
3   data, and wherein said extracting step extracts the value of said bit position.

1   40.   The invention as defined in claim 38 further comprising the step of
2   determining which bit position of said average of said values is carrying said watermark
3   data as a function of a busyness of said block, and wherein said extracting step extracts
4   the value of said bit position.

1   41. The invention as defined in claim 38 wherein said determining step further
2   comprises the steps of:
3   making a determination for each pixel in said block as to which chrominance
4   portion is most likely to tolerate a change in its value and not introduce thereby a visible
5   artifact; and
6   choosing as said selected chrominance portion the chrominance portion that was
7   determined in said making step for the most pixels of said block.

1   42. The invention as defined in claim 41 wherein said determination in said
2   making step is made for at least one pixel of said block as a function of a prestored table
3   in computer readable form that indicates for each area within at least a colorspace portion
4   which chrominance portion should be selected for pixels within said each area.

1   43. The invention as defined in claim 41 wherein said determination in said

2   making step is made for at least one pixel of said block as a function of a calculation that

3   indicates which chrominance portion should be selected for a pixel as a function of values

4   of said pixel.

1   44. The invention as defined in claim 38 further comprising the step of

2   deinterleaving said watermark data after it is extracted.

1   45. The invention as defined in claim 44 further comprising the step of channel

2   decoding said deinterleaved extracted watermark data.

1   46. The invention as defined in claim 38 further comprising the step of channel

2   decoding said extracted watermark data.

1   47. The invention as defined in claim 38 further comprising the step of

2   computing said average of the values of said chrominance portion of the pixels of said at

3   least one block of said at least one frame from the values of said chrominance portion of

4   said pixels of said at least one block of said at least one frame.

1   48. The invention as defined in claim 38 wherein said block of said video signal

2   is in a reduced resolution format such that for each 2x2 luminance block of an original

3   version of said video signal, had said original version of said video signal been in 4-4-4

4   representation, there remains only one Y, one U, and one V value.

1   49. The invention as defined in claim 48 further comprising the step of

2   decimating an original video signal to produce said watermarked video signal with a

3   reduced resolution format such that for each 2x2 luminance block of said original video

4   signal, had said original video signal been in 4-4-4 representation, there remains only one

5   Y, one U, and one V value.

1   50.   A receiver for use in extracting watermark data from a watermarked video
2 signal, wherein said watermark data is carried in at least one bit position of an average of
3 the values of a chrominance portion of the pixels of at least one block of at least one
4 frame, said receiver comprising:
5   a color selector for indicating which chrominance portion is likely to be carrying
6 said watermark data in said average of said values of said chrominance portion for said
7 block;
8   a block integrator for computing said average of said values of said chrominance
9 portion for said block; and
10   a bit selector that supplies as an output said watermark data from said average of
11 said values of said selected chrominance portion.

1   51.   The invention as defined in claim 50 further comprising a block variance
2 calculator that determines, based on at least one texture variance of said block, which bit
3 position of said average of said values of said selected chrominance portion should be
4 supplied as said watermark data by said bit selector.

1   52.   The invention as defined in claim 51 a decimator that produces said
2 watermarked video signal from an original video signal such that for each 2x2 luminance
3 block of said original video signal, had said original video signal been in 4-4-4
4 representation, there remains only one Y, one U, and one V value in said watermarked
5 video signal.

1   53.   A processor for embedding additional watermarking data within a video
2 signal, said processor being operative:
3   to select a chrominance portion of a block of said video signal to carry a portion
4 of said additional watermarking data; and
5   to cause a change in the average value of said selected chrominance portion so as
6 to incorporate at least a portion of said additional watermarking data within said changed
7 average value.

1   54.   Software in computer executable format for embedding additional

2   watermarking data within a video signal, said software comprising:

3   a module to select a chrominance portion of a block of said video signal to carry a

4   portion of said additional watermarking data; and

5   a module to a change in the average value of said selected chrominance portion so

6   as to incorporate at least a portion of said additional watermarking data within said

7   changed average value.

1   55. Apparatus for use in extracting watermark data from a watermarked video

2   signal, wherein said watermark data is carried in at least one bit position of an average of

3   the values of a chrominance portion of the pixels of at least one block of at least one

4   frame, said apparatus comprising:

5   means for selecting a chrominance portion is likely to be carrying said watermark

6   data in said average of said values of said chrominance portion for said block; and

7   means for extracting said watermark data from said average of said values of said

8   selected chrominance portion.

1   56. A method for use in extracting watermark data from a watermarked video

2   signal, wherein said watermark data is carried in at least one bit position of an average of

3   the values of a chrominance portion of the pixels of at least one block of at least one

4   frame, said method comprising the steps of:

5   selecting a chrominance portion is likely to be carrying said watermark data in

6   said average of said values of said chrominance portion for said block; and

7   extracting said watermark data from said average of said values of said selected

8   chrominance portion.

1   57.   Apparatus for for embedding watermarking data within a video signal,

2   comprising:

3   means for receiving a video signal in a frequency domain based format; and

4   means for changing a DC coefficient of at least one block of said video signal to

5   carry at least a portion of said watermarking data.